U 013457-4

WHAT IS CLAIMED IS:

CLAIMS

1. A method for determining a state variable **x** from at least one sensor value by a cost function prepared for a measurement value **y** for use in an arithmetic unit of a sensor system having at least one sensor, wherein the cost function depends on the respective state **x** to be measured and indicates deviation of an actual measured value from a calibration as a function of the state **x** in order to determine from this minimum the sought state **x**, the improvement comprising:

providing at least one approximation function based on at least one approximation region within the state region **x** to obtain an approximation of the cost function with approximation functions with negligible error, wherein the sums of the approximation regions cover the entire relevant state region, and

determining all local minima on the basis of the approximation, at least in a selection of approximation regions,

2. The method of claim 1, comprising determining a global minimum from comparison of the local minima.

3. The method of claim 1, comprising determining all minima in each approximation region for determining the minimum of the cost function.

4. The method of claim 1, wherein an approximation of the cost function is conducted, and, for determining the minimum of the cost function in a selection of appropriately established approximation regions, to obtain minima values in each approximation region, a determination of a local minimum value is made based on a quadratic approximation function, each local minimum value **x** is being determined in the neighborhood of a selected grid point, proceeding from a start vector $\mathbf{x}_0$ and by the sum of the respective starting vector $\mathbf{x}_0$ and a weighted difference of the measured value from a calibration value as a function of a start vector.

5. The method of claim 4 wherein the approximation functions and the neighborhoods are established so that the approximation function has only one minimum in the vicinity of the respective grid point and that the local minimum is determined by a gradient function.

6. The method of claim 1 wherein the approximation function has minima which can be determined by analytical methods.

7. The method of claim 1 wherein the at-least one approximation function and the at-least one approximation region are produced in a recursive procedure prior to establishing the

cost function.

8. A sensor system having at least one sensor (3) for detecting a system state and an arithmetic unit (4) associated, therewith said arithmetic unit (4) carrying out the method for determining a state variable from at least one sensor value according to claim 1.